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OBSERVATIONS ON *MEDICAGO LUPULINA* L.

OWING to the occasional adulteration of alfalfa seed with yellow trefoil, *Medicago lupulina*, this plant is of considerable interest to alfalfa growers in the eastern states. It is encouraging to note that such adulteration is less common than formerly. Of 491 samples of alfalfa seed examined by the writer at the New York Experiment Station during the past eighteen months, only seven showed evidence of adulteration with yellow trefoil.

In botanical works *Medicago lupulina* is sometimes described as an annual and sometimes as "annual or biennial." Careful observation has shown that in alfalfa fields in New York it is regularly a biennial. Even when the seed is sown in spring only occasional plants blossom and seed the first year. The great majority do not bloom until the second year in the latter part of May, shortly before the first cutting of alfalfa. At this time the plants are very conspicuous because of their yellow blossoms; but they do not reappear in subsequent cuttings of the alfalfa.

That the plants actually do live over winter is proved by the results of the following experiment: On March 29, 1907, nine plants suspected of being *M. lupulina* were transplanted into the station greenhouse. Six of these were taken from an alfalfa field and three from a lawn on the station grounds. They all blossomed and proved to be as suspected.

Except when the two plants are in bloom, *M. lupulina* so closely resembles alfalfa, *M. sativa*, that the two species are distinguished with difficulty. This is especially true in the early stages of growth. The writer has sought unsuccessfully for morphological or anatomical characters by means of which the two species may be separated with ease and certainty. In early spring the most reliable characters by which the two species may be separated are, (1) the habit of growth of the crown and (2) the character of the root system. The crown of *M. lupulina* is spreading, very similar to that of red clover, and the stems are procumbent; while the crown of alfalfa is upright in habit. The root systems offer a more striking difference. Alfalfa has

a large tap-root with very few side roots. *M. lupulina* has a small tap-root nearly concealed in a mass of fibrous side roots.

In conclusion, it may be of interest to note the finding of a *M. lupulina* seedling having three cotyledons. G. T. FRENCH

NEW YORK EXPERIMENT STATION,
GENEVA, NEW YORK

SOCIETIES AND ACADEMIES

THE GEOLOGICAL SOCIETY OF WASHINGTON

At the 207th meeting of the society, on May 27, Mr. F. E. Matthes discussed informally "Refusion of Cinders by Camp Fires on San Francisco Mountains, Arizona." Mr. L. D. Burling also discussed briefly "Colored Photography in Geology."

Regular Program

The Coalinga, California, Oil Field: Mr. RALPH ARNOLD and Mr. ROBERT ANDERSON.

The Coalinga District is situated on the eastern flank of the Diablo Range, along the border of the central valley of California. This flank of the range is formed of an eastward dipping monocline that exposes the Franciscan (probably Jurassic) in the axis of the range and above this about 26,000 feet of strata representing a considerable portion of the time up to the middle Pleistocene. There are at least 12,000 feet of Cretaceous, including lower and upper Cretaceous, with a probable unconformity between, and 14,000 feet of Tertiary and Quaternary beds composing six mutually unconformable formations. These belong to the Eocene, lower Miocene, upper Miocene, Pliocene and lower Pleistocene. The youngest formation that has undergone folding comprises a thickness of at least 2,500 feet of unconsolidated coarse and fine sediments belonging to the Pliocene and lower Pleistocene, and has been correlated with the Paso Robles formation of the Salinas Valley. It is of freshwater origin at the base and in part marine above, but is thought to have originated in large measure subaerially as a filling in the Great Valley of California. Great orogenic movements took place in the Pleistocene and in places lifted the deposits forming the floor of the central valley into steeply dipping folds. These folds are topographic as well as structural arches and afford a rare instance of the preservation of the original domes due to warping of the surface.

The petroleum occurs in beds and lenses of sand and gravel in the Eocene, lower Miocene